Notice of Allowability	Application No.	Applicant(s)	
	10/736,128	GIFFORD ET AL.	
	Examiner	Art Unit	
	Jason M. Perilla	2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *the amendment filed September 28, 2007*.

2. ☒ The allowed claim(s) is/are *15, 16, 17, 21, 24, 25, 27, and 29 renumbered as claims 1-8*.

3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☒ Interview Summary (PTO-413), Paper No./Mail Date *20071105* .
7. ☒ Examiner's Amendment/Comment
8. ☐ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

EXAMINER'S AMENDMENT

1. Claims 15, 16, 17, 21, 24, 25, 27, and 29 are pending in the instant application.

2. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR § 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Mark Vrla on November 5, 2007.

The application has been amended as follows wherein the following versions of claims 15, 16, 21, 24, 27, and 29 are replaced in their entirety:

15. A diversity signal combiner system for a digital communications system, comprising:

a plurality of channels each for receiving a channel signal of a plurality of channel signals from a spatially diverse antenna array element;

a plurality of downconverters each on one of the plurality of channels for downconverting a corresponding channel signal to baseband;

a co-phasing software block for resolving phase differences among the plurality of channel signals after the plurality of channel signals are downconverted by the plurality of downconverters;

a combiner for combining the plurality of channel signals by weighting and delaying each of the plurality of channel signals after the co-phasing software block resolves the phase differences among the plurality of channel signals;

a symbol synchronizer for determining symbol boundaries of the plurality of channel signals after the combiner combines the plurality of channel signals to enable

a system signal to be accurately demodulated to accurately represent transmitted data, wherein the symbol synchronizer includes a single complex sliding window matched filter for filtering the plurality of channel signals after the combiner combines the plurality of channel signals with a match filtering function based on predetermined signal transfer function characteristics to average noise out of the plurality of channel signals and thereby maximize a signal-to-noise ratio of each of the plurality of channel signals; and

an equalizer for receiving the plurality of channel signals from the combiner, for providing channel estimates of complex channel gain when necessary, and for removing channel effects from the plurality of channel signals before the plurality of channel signals are input into the single complex sliding window matched filter;

~~wherein the symbol synchronizer includes a single complex sliding window matched filter for filtering the plurality of channel signals with a match filtering function based on predetermined signal transfer function characteristics to average noise out of the plurality of channel signals and thereby maximize a signal-to-noise ratio of each of the plurality of channel signals; and~~

wherein the symbol synchronizer is for providing a variable step size parameter to the equalizer according to a confidence measure of correct symbol boundary estimation.

16. A diversity signal combiner system for a digital communications system, comprising:

a plurality of channels each for receiving a channel signal of a plurality of channel signals from a spatially diverse antenna array element;

a plurality of downconverters each on one of the plurality of channels for downconverting a corresponding channel signal to baseband;

a co-phasing software block for resolving phase differences among the plurality of channel signals after the plurality of channel signals are downconverted by the plurality of downconverters;

a combiner for combining the plurality of channel signals by weighting and delaying each of the plurality of channel signals after the co-phasing software block resolves the phase differences among the plurality of channel signals;

a symbol synchronizer for determining symbol boundaries of the plurality of channel signals after the combiner combines the plurality of channel signals to enable a system signal to be accurately demodulated to accurately represent transmitted data wherein the symbol synchronizer includes a single complex sliding window matched filter for filtering the plurality of channel signals with a match filtering function based on predetermined signal transfer function characteristics to average noise out of the plurality of channel signals and thereby maximize a signal-to-noise ratio of each of the plurality of channel signals;

an equalizer for receiving the plurality of channel signals from the combiner, for providing channel estimates of complex channel gain when necessary, and for removing channel effects from the plurality of channel signals before the plurality of channel signals are input into the single complex sliding window matched filter; and

an adaptive weight, delay and phase adapter connected between the combiner and the equalizer for estimating and correcting phase gain, frequency and sampling error effects, and for receiving feedback from the single complex sliding window matched filter and the symbol synchronizer for providing a variable step size parameter, and fast error convergence, in the equalizer[[;]]

~~wherein the symbol synchronizer includes a single complex sliding window matched filter for filtering the plurality of channel signals with a match filtering function based on predetermined signal transfer function characteristics to average noise~~

~~out of the plurality of channel signals and thereby maximize a signal-to-noise ratio of each of the plurality of channel signals~~.

21. A diversity signal combiner system for a digital communications system, comprising:

a plurality of channels each for receiving a signal from a spatially diverse antenna array element;

a plurality of downconverters each on one of the plurality of channels for downconverting a corresponding plurality of channel signals to baseband;

a plurality of matched filters each being located on one of the plurality of channels for filtering the ~~corresponding~~ plurality of channel signals after the plurality of channel signals are downconverted by the plurality of downconverters with a match filtering function based on predetermined signal transfer function characteristics to average noise out of the ~~corresponding~~ plurality of channel signals to maximize a signal-to-noise ratio of each of the plurality of channel signals;

a combiner for combining each of the plurality of channel signals output from the plurality of matched filters by appropriately weighting and delaying each of the plurality of channel signals;

a symbol synchronizer for determining symbol boundaries of the plurality of channel signals output from the plurality of matched filters as the combiner weights and delays each of the plurality of channel signals, thereby causing a single combined signal ~~with digital sampling~~ to be output from the combiner;

an adaptive delay/phase updater for receiving digitally sampled signals from a variable delay in each of the plurality of channels; and

an equalizer for generating a signal phase/delay estimation error and for inputting the signal phase/delay estimation error into the adaptive phase/delay updater;

wherein the symbol synchronizer is further for generating a confidence measure and inputting the confidence measure into the adaptive phase/delay updater; and

wherein the adaptive phase/delay updater measures and updates the signal phase/delay estimation error based on the confidence measure.

24. A diversity signal combiner system for a digital communications system, comprising:

a plurality of channels each for receiving a signal from a spatially diverse antenna array element;

a plurality of downconverters each on one of the plurality of channels for downconverting a ~~corresponding plurality~~ of channel signal[[s]] to baseband;

a plurality of matched filters each being located on one of the plurality of channels for filtering the ~~corresponding~~ plurality of channel signals after the plurality of channels signals are downconverted by the plurality of downconverters with a match filtering function based on predetermined signal transfer function characteristics to average noise out of the ~~corresponding~~ plurality of channel signals to maximize a signal-to-noise ratio of each of the plurality of channel signals;

a combiner for combining each of the plurality of channel signals output from the plurality of matched filters by appropriately weighting and delaying each of the plurality of channel signals;

a symbol synchronizer for determining symbol boundaries of the plurality of channel signals output from the plurality of matched filters as the combiner weights and delays each of the plurality of channel signals, thereby causing a single combined signal ~~with digital sampling~~ to be output from the combiner;

an equalizer for receiving the combined channel signals from the combiner and for providing combiner weight updating on the plurality of channels signals; and

a sampling time update block for executing a sampling time update equation and for outputting results of the executed sampling time update equation to the plurality of downconverters to control a sampling time of the plurality of channel signals input to the plurality of downconverters.

27. A diversity signal combiner system for a digital communications system, comprising:

a plurality of channels each for receiving a signal from a spatially diverse antenna array element;

a plurality of downconverters each on one of the plurality of channels for downconverting a corresponding ~~plurality of~~ channel signal[[s]] to baseband;

a plurality of matched filters each being located on one of the plurality of channels for filtering the ~~corresponding~~ plurality of channel signals after the plurality of channel signals are downconverted by the plurality of downconverters with a match filtering function based on predetermined signal transfer function characteristics to average noise out of the ~~corresponding~~ plurality of channel signals to maximize a signal-to-noise ratio of each of the plurality of channel signals;

a combiner for combining each of the plurality of channel signals output from the plurality of matched filters by appropriately weighting and delaying each of the plurality of channel signals;

a symbol synchronizer for determining symbol boundaries of the plurality of channel signals output from the plurality of matched filters as the combiner weights and delays each of the plurality of channel signals, thereby causing a single combined signal ~~with digital sampling~~ to be output from the combiner; and

an equalizer for receiving the combined channel signals from the combiner and for providing combiner weight updating on the plurality of channels signals;

wherein the equalizer further includes a vector line for accepting output samples from the plurality of matched filters, the equalizer further for estimating a complex channel gain for each of the plurality of channels based on the accepted output samples; and

wherein the equalizer is further for generating a weight vector output for correcting channel complex gain errors.

29. A diversity signal combiner system for a digital communications system, comprising:

a plurality of channels each for receiving a signal from a spatially diverse antenna array element;

a plurality of downconverters each on one of the plurality of channels for downconverting a corresponding ~~plurality of~~ channel signal[[s]] to baseband;

a plurality of matched filters each being located on one of the plurality of channels for filtering the ~~corresponding~~ plurality of channel signals after the plurality of channel signals are downconverted by the plurality of downconverters with a match filtering function based on predetermined signal transfer function characteristics to average noise out of the ~~corresponding~~ plurality of channel signals to maximize a signal-to-noise ratio of each of the plurality of channel signals;

a combiner for combining each of the plurality of channel signals output from the plurality of matched filters by appropriately weighting and delaying each of the plurality of channel signals;

a symbol synchronizer for determining symbol boundaries of the plurality of channel signals output from the plurality of matched filters as the combiner weights and delays each of the plurality of channel signals, thereby causing a single combined signal ~~with digital sampling~~ to be output from the combiner; and

an equalizer for receiving the combined channel signals from the combiner and for providing combiner weight updating on the plurality of channels signals;

wherein the symbol synchronizer is further for providing a control signal to the equalizer for providing optimal sampling at an output of the equalizer to minimize a demodulated data bit error rate.

Claims 15, 16, 17, 21, 24, 25, 27, and 29 are renumbered respectively as claims 1-8, and the claim dependency is renumbered accordingly.

Allowable Subject Matter

3. Claims 15, 16, 17, 21, 24, 25, 27, and 29 renumbered respectively as claims 1-8 are allowed.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jason M. Perilla whose telephone number is (571) 272-3055. The examiner can normally be reached on M-F 8-5 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chieh M. Fan can be reached on (571) 272-3042. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Jason Perilla
November 5, 2007

jmp

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